



Fort Keogh Researcher

USDA-ARS
Livestock and Range Research Laboratory



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Introduction

*Dr. Rod Heitschmidt
Research Leader*

It is my privilege to introduce you to the *Fort Keogh Researcher*. The purpose of this publication is to provide our customers with fundamental information about Fort Keogh, its people and other resources, important outreach activities, and a cross-section of our latest research findings. This will be a periodic publication with no set dates of publication. We will "run the press" when appropriate.

We also intend to develop a relational information base that extends across issues. By that I mean, we do not intend to repeat-

edly print the same information. Thus, we recommend that our readers maintain a file of the *Fort Keogh Researcher* for future reference (a pdf file will be available on our website at <http://www.larri.ars.usda.gov>).

As an introduction to Fort Keogh, I will briefly review our history as a military fort and research laboratory and provide an overview of our resources and administrative structure.

Military History - Fort Keogh was established by Congress as an Army Cavalry post on July 22, 1876, approximately one month after the Battle of the Little Bighorn. The 100 section, 64,000 acre Fort was named after Captain Myles Keogh, an adjutant to Gen-



*Rod Heitschmidt, Research Leader
and Range Ecologist*

eral Custer at the Battle. The initial commander of Fort Keogh was General Nelson Miles for whom Miles City is named.

In 1907, all infantry troops were withdrawn from the Fort and in 1909 it was designated a Remount Station. Reportedly, more horses were processed at

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Our Vision:

A world-renowned research program that provides knowledge relevant to efficiently producing nutritious and palatable beef from rangeland based livestock production systems.

Our Mission:

To develop ecologically and economically sustainable range livestock production systems that meet consumers' expectations.

January 2002

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Fort Keogh than any other Remount Station during World War I. The Army relinquished the land in 1922 and following the complete withdrawal of all military personnel in 1924, Congress transferred Fort Keogh to the U.S. Department of Agriculture for the purpose of conducting agricultural research. The date of transfer was April 15, 1924. For a more detailed treatment of the Fort Keogh's military history, we recommend reading Josef Warhank's unpublished California State University Masters of Arts thesis entitled *Fort Keogh: Cutting Edge of a Culture* available on our website.

Research History - The earliest research at Fort Keogh focused on animal genetics and range management. At one time the Fort maintained purebred herds/flocks of Rambouillet ewes, Belgian, Morgan and Thoroughbred horses, Bronze turkeys, Milking Shorthorn cattle, Wiltshire Side hogs, and Hereford cattle. Gradually, the sheep, horse, turkey, milk cow, and hog research was phased out with the last to go being the hog research in 1986. Today, the animal research herd is restricted to beef cattle and includes research conducted in three broad disciplines; genetics, reproductive physiology, and nutrition.

The earliest range research began in the 1930's under the direction of the

U.S. Forest Service. This pioneering research focused on establishing "safe" winter and summer stocking rates for the Northern Great Plains. Today, the range management research is conducted in three broad disciplines; rangeland ecology, plant ecophysiology, and animal nutrition.

Resources - The Fort currently consists of about 55,000 acres of which about 50,000 acres are native rangeland, 2,500 acres are dryland planted pasture, 1,000 acres are irrigated pasture, and 700 acres are irrigated cropland. The remaining 800 acres are the headquarters area, corrals, etc. We have about 400 miles of fence and 220 miles of roads and trails.

The irrigated farming operation produces about 3,500 T of alfalfa hay, 5,000 T of corn silage, 7,500 bushels of barley grain, 150 T of sorghum sudan hay, plus an assortment of barley straw and grass hays. All farm products are used for livestock feed.

The beef cow herds consists of about 250 Line 1 Herefords, the oldest and purest line of Herefords in the world; 400 CGC's, a composite gene combination herd consisting of 50% Red Angus, 25% Tarentaise, and 25% Charolais; and about 750 mixed breeds cows. We

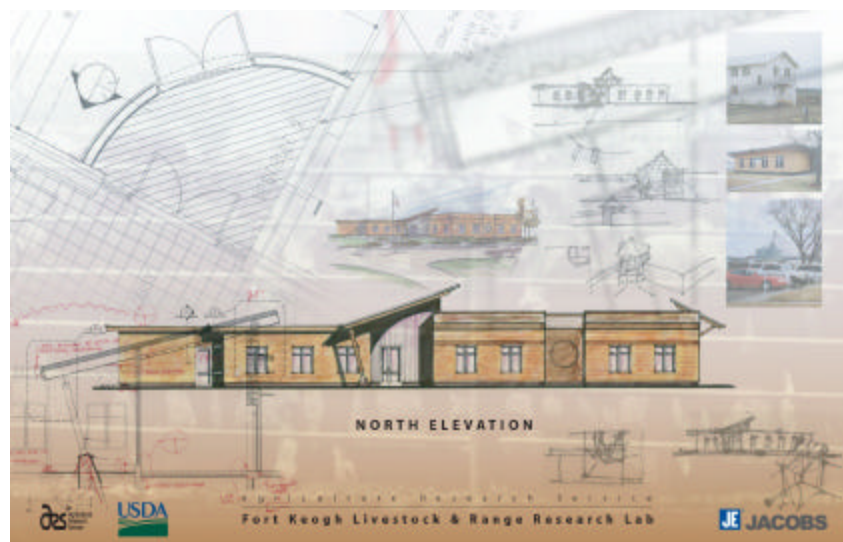
have a modern 40,000 bushel feed mill and two feedlots that can accommodate about 1,000 head of growing cattle.

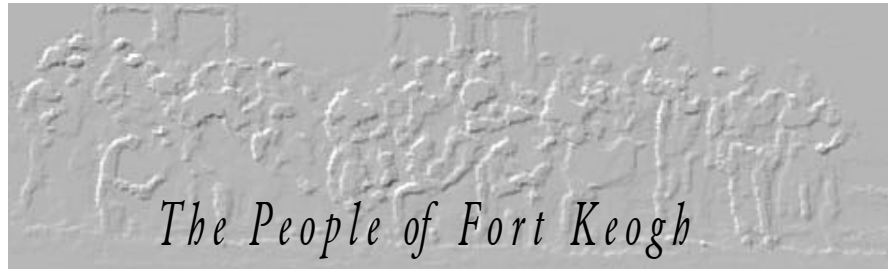
The Fort Keogh staff consists of 22 USDA Agricultural Research Service (ARS) employees and 20 Montana Agricultural Experiment Station (MAES) employees plus 5 - 10 seasonal employees. The scientists and most of the technicians are ARS employees whereas the outside cowboy, farm, and maintenance crews are MAES employees. There are 8 scientists; 2 geneticists, 2 reproductive physiologists, 1 range animal nutritionist, and 3 rangeland scientists. In addition, we have a Montana State Extension Service Beef Cattle Extension Specialist officed at Fort Keogh.

Administration - Administration is a cooperative venture between the ARS and MAES in that ARS owns the land, facilities, and most of the equipment whereas MAES owns the livestock. Funding for the operation is through USDA and the sale of livestock. No State of Montana funds are used at Fort Keogh other than those funds realized from the sale of livestock. The ARS Research Leader has a MAES courtesy appointment of Superintendent.

Building Design Progress

Fort Keogh is in the process of adding onto the main office/laboratory building. The additions will total \$4.3 million. A conference and training center will be added to the front of the building, and new laboratories, associated offices and a greenhouse onto the back of the building. Design is nearing completion with ground breaking scheduled for late summer.





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Research Brief

Prepartum Supplementation with Protein or Fat and Protein for Grazing Cows in Three Seasons of Calving

Elaine E. Grings, Beef Cattle Nutritionist



Supplementation of beef cows with dietary fat either before or after calving has been shown to improve reproductive performance in some studies. It is suggested that fat may act as a 'neutraceutical' to influence reproduction. 'Neutra-ceuticals' are feedstuffs or feed additives that have physiological effects outside of their generally accepted role as a nutrient source. Dr. Robert Bellows, now retired from LARRL, conducted several studies on fat supplementation for first-calf heifers fed corn silage-based diets. Reproduction in heifers fed safflower seed as a fat source for about two months before calving was compared to reproduction in heifers not fed safflower seed. Benefits were seen in fall pregnancy rates of heifers fed safflower seed in several trials.

While some studies have shown positive responses to fat feeding, others have not. We believe some of the difference between experiments is due to the nutritional quality of diets fed between calving and breeding. Cows grazing rangelands exist under a dynamic environment where rapid changes in forage quality can occur. Time of calving and individual years can have significant impacts on the quality of diets for grazing cows both be-

fore and after calving. This varied forage quality may have some effect on the response to fat supplementation. Some of Dr. Bellows' research suggested that season of calving could play a role in the reproductive response to dietary fat level by altering post-calving nutrition.

Much of the research testing the effects of fat supplementation on reproduction has been conducted with first-calf heifers. These heifers are under greater nutritional stress than older cows because of the compounding need for nutrients for both growth and milk production. Therefore, young cows may be more sensitive to

dietary fat levels than older cows.

To take a closer look at the interaction of pre- and post-calving forage quality on response to fat supplementation and to look at the effect of cow age, we conducted a study during 2 winter/spring periods using both 3-year-old and 5 to 7 year-old beef cows. Additionally, these cows were due to calve at one of three times: February, April, or June. This allowed us to observe the effects of varied forage quality on response to supplementation.

Cows grazing native range
(Continued on page 5)

Table 1. Quality of range forage portion of diets for cows calving in three seasons.			
	Season of Calving		
	February	April	June
Year 1			
Crude Protein, %	5.5	7.6	13.8
Ether Extract, %	2.3	1.4	1.8
Year 2			
Crude Protein %	4.9	4.5	7.4
Ether Extract, %	1.4	1.4	1.7

(Continued from page 4)

were supplemented with either protein and fat using safflower seed and safflower meal or were supplemented with protein but not fat using safflower meal and barley. Cows were moved to a drylot for calving and were fed hay and supplement until they calved. The total days of supplementation during the grazing and drylot periods averaged 71 days.

Quality of grazed forage was very different for cows calving at the three different times (Table 1). One question about fat feeding with poor quality range forage, like that for the February calving cows, is whether fat has a negative effect on the digestion of forage. We tested this in the laboratory and found that fat supplementation was not affecting forage digestibility even for the lower quality diets. Higher levels of fat could affect forage digestion, however.

Cows calving in June gained about 80 pounds more during the precalving period than other calving groups and were in better body condition at calving. February calving cows lost condition during the graz-

Table 3. Percentage of cows pregnant for 3-year-old or 5-year-old + cows fed either protein or protein + fat.

Cow Age	Season of Calving					
	February		April		June	
	3	5+	3	5+	3	5+
Protein Only	75	93	97	80	86	93
Protein + Fat	93	84	63	99	80	93

ing season, whereas June calving cows gained condition during this period. Cows fed protein only in the February calving group had higher body condition scores compared to those receiving protein + fat; the opposite was true for the April calving cows, and there was no difference due to the supplement type fed in the June calving group (Table 2). Any effects of the type of pre-calving supplement on weight or body condition were gone by the beginning of the breeding season.

Three-year-old cows calving in February and 5+-year-old cows calving in April fed supplement with both protein and fat had greater pregnancy rates than cows fed protein only, but the opposite was

found for 3-year-olds calving in April (Table 3). Pregnancy rates of cows calving in June was not affected by the type of supplement they received before calving.

These results differ from previous studies where pregnancy rate was improved by including safflower seed in the diets of first-calf heifers. Differences in how cows respond to dietary fat may be related to cow age or diet nutrient concentrations both pre- and post-calving. Higher body condition cows, i.e., June-calving cows receiving high post-calving nutrition associated with early summer forage, may be of adequate nutritional status and may not benefit from fat supplementation. Young cows under nutritional stress, i.e., 3-year-old April-calving cows, may use the fat to improve their own condition rather than as a reproductive trigger. The best response to fat supplementation may occur in young, moderate condition cows receiving moderate post-calving nutrition.



Table 2. Body condition score at calving for 3-year-old or 5-year-old + cow fed either protein only or protein plus fat.

Cow Age	Season of Calving					
	February		April		June	
	3	5+	3	5+	3	5+
Protein Only	4.3	5.2	3.6	4.6	4.8	5.5
Protein + Fat	4.0	5.1	4.2	5.2	4.6	5.4

Recent Publications

Technical Publications:

- Bellows, R. A., Grings, E. E., Simms, D. D., Geary T. W., Bergman, J. W. Effects of feeding supplemental fat during gestation to first-calf beef heifers. *Prof. Anim. Sci.* 17:81-89. 2001.
- Blummel, M., Grings, E.E., Moss, A.R., Givens, D.I. A mechanistic approach to the estimation of intake of ruminants by methane excretion and in vitro fermentation characteristics. *Proc. West. Sec. Am. Soc. Anim. Sci.* 52.: 475-478. 2001.
- Foster, H. A., Whittier, J. C., Burns, P. D., Bruemmer, J. E., Baker, D. S., Engle, T. E., Field, T. G., Wailes, W. R., Anderson, D. C., Boss, D.L., Geary, T. W. Use of bovine somatotropin in conjunction with the CO-Synch and Select Synch protocols for synchronizing estrus and ovulation in beef cows. *Proc. West. Sec. Am. Soc. Anim. Sci.* 52:66-69. 2001.
- Foster, H. A., Whittier, J. C., Burns, P. D., Bruemmer, J. E., Field, T.G. Geary, T. W. Half dose GnRH does not affect pregnancy rates with the CO-Synch estrus synchronization protocol. *Proc. Western Section Am. Soc. Anim. Sci.* 52:374-376. 2001.
- Funston, R. N., Geary, T. W., Ansoltegui, R. P., Lipsey, J. J., MacNeil, M. D., Paterson, J. A. Supplementation of whole sunflower seeds before AI in beef heifers. *Proc. West. Sec. Am. Soc. Anim. Sci.* 52:381-383. 2001.
- Geary, T. W., McFadin-Buff, E. L., MacNeil, M. D., Funston, R. N., Short, R. E., Grings, E. E., Keisler, D. H. A possible role of the leptin assay in assessing carcass fat and composition in beef cattle. *Proc. of the West. Sec. Am. Soc. Anim. Sci.* 52:253-255. 2001.
- Geary, T. W. Synchronize your cows before they run with the bulls. Shorten the breeding season and increase calf weights with synchronization. *Montana Farmer-Stockman.* March. p. 30-33. 2001.
- Geary, T. W., Salverson, R. R., and J. C. Whittier. Synchronization of ovulation using GnRH or hCG with the CO-Synch protocol in suckled beef cows. *J. Anim. Sci.* 79:2536-2541. 2001.
- Geary, T. W., Whittier, J. C., Hallford, D. M., MacNeil, M. D. Calf removal improves conception rates to the Ovsynch and CO-Synch protocols. *J. Anim. Sci.* 79:1-4. 2001.
- Geary, T. W., Whittier, J. C., Mortimer, R. G., Young, J. W., Salverson, R. R. Synchronization of estrus in beef cows using GnRH and PGF with estrus AI or timed AI 72 h after PGF with or without a second GnRH injection. *Proc. West. Sec. Am. Soc. Anim. Sci.* 52:369-371. 2001.
- Grings, E.E. Macromineral nutrition of grazing ruminants: Levels in forages grown in the Western U.S., and efficacy of supplementation. *Supplementation Strategies for Beef Cattle Consuming Low Quality Roughages in the Western United States. Oregon State University Agric. Exp. Stn. Bulletin* 683. p. 47-58. 2000.
- Grings, E.E., Short, R.E., Blummel, M., MacNeil, M.D., Bellows, R.A. Prepartum supplementation with protein or fat and protein for grazing cows in three seasons of calving. *Proc. West. Sec. Am. Soc. Anim. Sci.* 52:501-504. 2001.
- Grings, E.E., Short, R.E., Haferkamp, M.R., Heitschmidt, R.K. Animal age and sex effects on diets of grazing cattle. *J. Range Manage.* 54:77-81. 2001.
- Grings, E.E., Short, R.E., MacNeil, M.D., Roeder, R.A., Roeder, M.J. Interactions in postweaning production of F1 cattle from Hereford, Limousin, or Piedmontese sires. *J. Anim. Sci.* 79:317-324. 2001.
- Grosz, M. D. and M. D. MacNeil. Putative quantitative trait locus affecting birth weight on bovine chromosome 2. *J. Anim. Sci.* 79:68-72. 2001.
- Haferkamp, M.R., Grings, E.E., Heitschmidt, R.K., MacNeil, M. D. Livestock performance on seeded forages in the Northern Great Plains. *Proc. West. Sec. Amer. Soc. Anim. Sci.* 52:326-328. 2001.
- Haferkamp, M.R., Grings, E.E., Heitschmidt, R.K., MacNeil, M. D., and Karl, M.G. Suppression of annual bromes impacts rangeland: Animal responses. *J. Range Manage.* 54:663-668. 2001.
- Haferkamp, M.R., Grings, E.E., Heitschmidt, R.K., MacNeil, M. D., and Karl, M.G. Suppression of annual bromes impacts rangeland: Vegetation responses. *J. Range Manage.* 54:656-662. 2001.
- Hild, A.L., Karl, M.G., Haferkamp, M.R., Heitschmidt, R.K. Drought and grazing III: Root dynamics and germinable seed bank. *J. Range Manage.* 54:292-298. 2001.
- Klement, K.D., R.K. Heitschmidt, and C.E. Kay. 80 years of vegetation and landscape changes in the Northern Great Plains: A photographic record. *USDA Agric. Research Service Conservation Research Report No. 45, Beltsville, MD.* 2001.
- MacNeil, M.D., Short, R.E., Grings, E.E. Characterization of topcross progenies from Hereford, Limousin, and Piedmontese sires. *J. of Anim. Sci.* 79:1751-1756. 2001.
- Rule, D.C., Rule, J.M., Short, R. E., Grings, E.E., MacNeil, M.D.

Genotype effects on cholesterol and fatty acids in longissimus and semitendinosus muscles from Hereford, Limousin, and Piedmontese F2 crossbred cattle at slaughter. *Proc. West. Sec. Am. Soc. Anim. Sci.* 52:266-269. 2001.

Short, R. E., Grings, E. E., MacNeil, M. D. A model for determining risk of pine needle abortion in cattle calving at different times of the year. *Proc. West. Sec. Am. Soc. Anim. Sci.* 52:174-176. 2001.

Outreach Publications:

Funston, R.N. Beefability program completes 2nd year. *Ag Roundup*. September edition. 2000.

Funston, R.N. and T.W. Geary. Optimizing reproductive performance. *Montana Farmer Stockman and Western Beef Producer*. April. 2000.

Grings, E.E. and Schmidt, L. 2001. When the green grass grows. *Montana Farmer-Stockman*. P. 16-17. Sept. 2001.

Heitschmidt, R. K. Rangeland grazing management strategies, Part 2. *Montana Agriculture Extension Service BEEF Newsletter* 6(#4):4. 2000.

Heitschmidt, R. K. Fort Keogh researchers help producers increase the bottom line. *Montana Agriculture Extension Service BEEF Newsletter* 6(#4):5. 2000.

Heitschmidt, R.K. Grazing systems as resource management tools. *Proc. Sustainable Management of Rangeland Resource, Teton County Extension Service*. p. 18-20. 2001.

King, M., Paterson, J., Funston, R., and Anderson, L. 1999 survey reveals most common Montana ranch production practices. *Beef Questions and Answers*. Vol. 5(4):7. 2000.

MacNeil, M. D. How are milk production and milk EPD related? *Beef Questions and Answers* 6 (4):2. 2001.

Upcoming Events

February 6-10—*National Beef Cattlemen's Association Annual Meeting, Denver, CO*

- **Rod Heitschmidt & Rick Funston**

February 12 — *Baker*

- **Rick Funston**—*Decreasing harvested forage needs and nutrient requirements of beef cattle*

February 13-19—*Society for Range Management Meetings—Kansas City, NV*

- **Haferkamp, M.R. and K.D. Klement**: Poster—"Annual and Perennial Biomass Response to Nitrogen and Precipitation,"

- **Klement, K.D., R.K. Heitschmidt, and C.E. Kay**: Poster—"80 Years of Vegetation and Landscape Changes in the Northern Great Plains."

- **Heitschmidt, R.K. and L.A. Joyce**. Status of ecological criteria and indicators. *Sustainable Rangeland Roundtable Symposium*.

February 15-16 — *State 4-H Livestock Leaders Forum: Market animal quality assurance training, Billings, MT.*

- **Rick Funston**

February 19-20—*Tri-State Cow-Calf Management School; Reproductive Management, Genetic Management and Marketing Cull Cows, Logging Camp Ranch, Amidon, ND*

- **Rick Funston**

February 26 — *US Forest Service All Rangeland Scientist Review*

- **Rod Heitschmidt**, Our SRM partnership.

March 12-14 — *University of Idaho Range Days, Boise*

- **Rod Heitschmidt**, The effect of grazing during and after drought on rangeland sustainability

March 13-14 — *Carbon Dioxide Flux Network Meeting*

- **Marshall Haferkamp**

March 16—*Excess Bull Sale—Miles City Livestock Center—12:30 p.m. (Call Sandy at 232-8201 or Mike at 232-8213 to request a catalog.)*

April 3 - 7 — *North American Wildlife and Natural Resources Conference, Dallas, TX*

- **Rod Heitschmidt**

April 27 - 28 — *SRM Execs Meeting, Casper, WY*

- **Rod Heitschmidt**

May 7-8 — *Montana Livestock Nutrition Conference, Bozeman, MT*

- **Rick Funston**

May 28 - 31 — *Sustainable Rangeland Roundtable, Washington DC*

- **Rod Heitschmidt**

June 19-21 — *Western Section American Society of Animal Science Summer Meetings, Fort Collins, CO*

- **Rick Funston, Elaine Grings, Andy Roberts, Tom Geary, Mike MacNeil**

Mid Summer — *Watch for Groundbreaking for New Building & Field Day*

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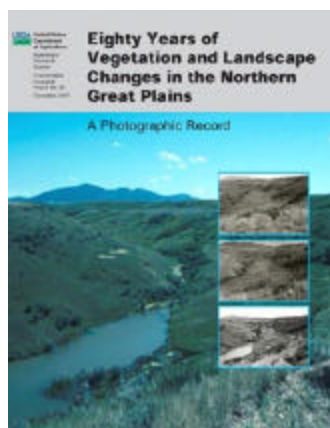
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New Book Published:



Eighty Years of Vegetation and Land- scape Changes in the Northern Great Plains: A Photographic Record

Conservation Research Report No. 45 was published in December 2001. The report is authored by Keith Klement, Rod Heitschmidt and Charles Kay. This publication is a photographic record of vegetation and landscape changes that have occurred at selected sites in the Northern Great Plains over the past 80 to 90 years. Based on photographic and written records, the authors found few changes had taken place other than 1) a general increase in the density and cover of woody plant species, particularly Ponderosa pine; 2) those resulting from direct human intervention, such as tillage, haying, and road construction; and 3) a general increase in nonindigenous species, particularly yellow sweet clover and crested wheatgrass, as they escape from roadside restoration projects and agronomic plantings. Otherwise the changes are subtle. Free copies are available from the station while supplies last.